ANNUAL ADDRESS.

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THE GEOGRAPHICAL WORK OF THE WORLD IN 1876.

Shakespeare, in his prologue to the play of "Henry V.," in view of the historical events which are there depicted, asks pardon of his audience for bringing "so great an object" within the small space of the Globe Theatre, reminding them that it could not hold "the vasty fields of France," nor could he cram within it the hosts that fought at Agincourt; and with much greater propriety should I apologize for attempting, within the compass of an hour, to give an account of the geographical work of the world, which is every year increasing in magnitude and in the wideness of its distribution.

I may begin by stating that the geographical feature of the past year has been the increased interest shown in the enlargement of geographical knowledge, not only by the investigations which have taken place, and the discoveries that have been made, but by the establishment of geographical societies in Amsterdam, Copenhagen, Marseilles, Lisbon, Madrid and Bucharest; by a large increase of members in the leading societies of England, France and Italy, and in the inauguration by the King of Belgium of an international organization, composed of prominent geographers, African explorers and the heads of the leading geographical societies, to carry on the work of exploring and civilizing the interior of Africa upon a systematic plan—a movement of great interest, and which in all probability will lead to very important results.

In the opening part of my address last year I gave a brief account of the rise of geographical societies, and of what had been effected since their institution. I then supposed that they originated with the formation of the Société de Géographie of Paris in 1821; but I find in a paper by Mr. V. A. Malte Brun, that a cosmographical society (Society of the Argonauts) was founded in Venice as early as

1688; and that a few years later an association of the same kind was established in Nuremberg; so that we have the interesting fact that geographical societies, of which there are now thirty-eight throughout the world, originated 188 years ago.

PHYSICAL GEOGRAPHY.

In an account of the geographical work of the last year, our attention should first be given to those investigations which relate to the world in general, as contradistinguished from those which relate to particular parts of it, under which head I shall first refer to physical geography, a line of inquiry in which there has been great activity during the year. This is shown by the number of valuable works relating to it that have been published, by the papers that have been read, and the discussions which have taken place upon various branches of this great subject before geographical and other scientific societies in different parts of the world.

At a meeting of the British Association at Glasgow, last September, Sir Wm. Thomson considered the subject of the interior of the earth. He said that the greatest depth that had been reached in observations of underground temperature was scarcely one kilometre (which is less than a mile); that whatever might be the age of the earth, we might be sure that it was solid in the interior—not through its whole volume, as there were spaces in volcanic regions occupied by liquid lava, but that this portion was small in comparison to the whole, and that any geological hypothesis must be rejected which assumes that the earth is a shell resting on a liquid mass. He also considered the question, first, of the accuracy of the earth as a time-keeper, and second, the permanence of its axes of rotation. He said that since the first known observation of an eclipse of the moon at Babylon, on the nineteenth of March, 721 B. C., the earth has lost a portion of its velocity, and is now, as a time-keeper, going slower.

His observation upon the question of the earth's axis was, in effect, that if causes existed adequate to produce a change in the position of the axis by the upheaving of the surface or otherwise, the result, even if sudden, would not be very great, or produce any extraordinary effect. Many important observations were made, at the same meeting, upon the tides and upon ocean temperature and currents, founded upon the results of the voyage of the Challenger, and an admirable address was delivered by Capt. R. S. Evans, R. N., upon the physical geography of the sea, to many things in which I would willingly refer but for my circumscribed limits.

THE "CHALLENGER."

Sir Wyville Thompson has given the general results of the expedition of the Challenger, and I shall abridge a statement of them, as far as possible, in Sir Wyville Thompson's words. The superficial area, he says, of this world of ours is 197,000,000 of square miles, of which 140,000,000 are covered by the sea at an average depth of 15,000 feet. This region, which, until recently, excited little curiosity, and which seemed to be practically inaccessible, we now know is, to a certain degree, comparable to the land. It has its hills, valleys and great undulatory plains; its various soils of widely diffused materials; it has its climates, whatever the exceptional conditions of these climates may be, and its special races of inhabitants, which depend, like the inhabitants of the earth, upon the condition of climate and on the nature of the soil for their distribution. The object, he continues, of the expedition was to investigate the physical and biological condition of the great ocean basin. The vessel departed from England in December, 1872. She crossed the Atlantic four times in 1873, in a course of nearly 20,000 miles. In 1874 she went southwards from the Cape of Good Hope, dipping within the Antarctic circle as far as she could, and then traversed the Australian and New Zealand seas and the interior of the Malay Archipelago, arriving at Hong Kong on November 10, 1874, after a run, in that year of 17,000 miles. In 1875 she traversed the Pacific, in a course of about 20,000 miles, and then crossed the Atlantic for the fifth time, reaching England May 24, 1876. He then states the three general results: 1. The knowledge obtained of the contour of the bottom and the nature of the deposits now being formed. 2. The distribution of deep sea climate. 3. The nature and distribution of the peculiar race of animals now found at the bottom of the sea. In the Pacific there is an enormous extension of water of great depth, in many cases beyond 18,000 feet. In the North Atlantic the greater portion has a depth of 12,000 feet; and in the South Atlantic, on each side of what is known as the Dolphin rise, there are troughs usually 18,000 feet deep, which form marked depressions roughly parallel with the arc of the South American and African continents. The whole bottom of the sea is gradually receiving accumulations, giving rise to formations which must be regarded as the rocks of the future. The debris of the land was found to be carried out into the sea some hundreds of miles, and clays were being formed mixed up with the debris of animals. Within a certain distance of the land the deposits, to a great extent, were of

this material. Over a great part of the North Atlantic there is being deposited the *Globigerina* ooze, composed principally of small chambered shells, extremely minute, and these shells were found in enormous quantities. This deposit is almost entirely of carbonate of lime, and the only rock it could form would be limestone. Therefore, over a large part of the North Atlantic, and over many other parts of the world, this limestone is being laid down. As this modern chalk was brought up the question arose, where did these creatures live—on the bottom or on the surface? The general impression was that they lived at the bottom, where the dead shells were found, but upon investigation the conclusion arrived at was that they lived on the surface and a little below it, and that the whole material of the bottom, composed of these shells, is derived from the surface. The shell has a little animal in it, a particle of gelatinous matter like the white of an egg, and when alive this matter runs out of the holes of the shell to the end of the spines, where it absorbs minute particles of organic matter floating on the surface. It might be supposed that this formation ought to be as universal as is the distribution of these animals on the surface. Singularly enough this is not the case. At the depth of 12,000 feet the shells become rotten and yellow; at 13,000 feet there are no shells, but the bottom is one of homogeneous red mud, which, instead of consisting of carbonate of lime, is ordinary clay, the carbonate of lime being in some way removed from the shells of these creatures. I may here interpolate a fact to show how abundant animal life is at or very near the surface of the ocean. The steamer Great Eastern was lately in dock at Milford Haven for the examination of her bottom, which had not been scraped since 1867. Her bottom was found covered with an enormous multitude of mussels, clustered together in one dense and continuous deposit, extending over 52,000 square feet, and which, upon a calculation made, amounted to not less than *three hundred tons* weight, or enough to load with a full cargo two ordinary collier brigs.

A curious fact observed in the voyage of the Challenger was that all over the bottom of the sea there is a large quantity of pumice, showing that there are volcanoes, either below the water or otherwise, that are constantly throwing out material from the crust of the earth. This pumice, which is the froth of lava, is frequently so light as to float on the water, and wherever they were, in any part of the world, they saw it moved about by the current over the surface of the sea. They found living in the sea, on the surface or just

below, a great quantity of beautiful organisms called *Radiolaria*. They increase with the depth, and many occur at great depths that are not found on the surface at all. The impression formed was that they lived all through the sea, and down to the greatest depths.

The whole bottom of the Pacific, or the greater part of it, is red clay. The temperature of the ocean at 13,000 feet is very low. It is usually but a little above the freezing point at the bottom of the Pacific and the Atlantic, and portions of the Southern sea. The general temperature gradually falls from the surface until the depth of 13,000 feet, below which there is, throughout the sea, a uniform temperature of 37° or 34°, or a little above the freezing point. The question arose, whence does the ocean derive this low and uniform temperature? It is a question of great difficulty, and the conjecture made is that it is an inflow of the cold water from the vast area of the Antarctic.

In respect to animal life, the deep sea, so far from being barren, has a fauna remarkably constituted, comparatively rich, and universally distributed to the greatest depths. It was supposed to be analogous to the ancient chalk, but upon examination this was found not to be the case, except in a few instances. The fauna of the deep sea is wonderfully uniform throughout, and many of the formations are delicately intricate and exquisitely beautiful.

Meteorological and magnetic observations have been carried on extensively during the year, but any account of them would involve an amount of detail too great for this address.

TERRESTRIAL DISTURBANCES.

Every year denotes how active and continuous are those disturbances that affect the earth's surface, and it is only since we have begun to note them from year to year, as they occur over the whole extent of the globe, that we have been able to form some adequate conception of the effects which such disturbances, operating over vast periods of time, have had upon the earth's surface.

Earthquakes during the year have been numerous and widely distributed, and there have been destructive floods in Europe and very disastrous cyclones in Asia. A cyclone swept over the island of Réunion, in the Indian Ocean, an island about fifty miles long by about thirty wide, and damaged every part of it, and a cyclone wave unexampled in its injurious effects swept over the low-lying district at the mouth of the Ganges, at midnight, on the thirty-first

of last October, by which, according to the London Times, 215,000 persons lost their lives, which is believed to be rather below than above the real estimate.

What changes may be effected by the slow but continuous operation of other causes may be illustrated by the island of Heligoland, at the mouth of the River Elbe. In the ninth century this island was 120 miles in extent, in the fourteenth century it was reduced to forty-five miles, in the middle of the seventeenth century to four miles, and it is now less than one mile in superficial extent. This has been effected by the action of the sea from the north-east; that is, by the set of the current and the prevailing winds; the island having lost only one mile from the opposite direction from the earliest records.

THE ORAL TELEGRAPH.

As pertaining to the earth in general, I may mention an extraordinary invention in connection with the telegraph. The wonder of Gray's electro-telephone, sending four messages at once, and capable with certain improvements of doing four times as much, has been surpassed by the invention by Mr. Graham Bell, a young Scotchman residing in Boston, by which a message is transmitted orally. A person at one end of the wire delivers the message by word of mouth, and a person at the other, by applying his ear, hears the words that are uttered. Sir Wm. Thomson, the very highest authority on such a subject, considers this invention one of the marvels of our age, he having himself tested it during his recent visit to the Centennial.

THE ANTIQUITY OF MAN.

The subject of the antiquity of man is one upon which light is constantly shed by new discoveries and investigations.

The combined labor of Messrs. Whitney, Dawkins, Tiddeman, Croll, Skertchley and Geikie have added to the conviction that man existed during the glacial epoch; that that period was not an uninterrupted one of cold, there being at least four ice ages, with intervening cold and warm periods, and that during these periods as indicated by the remains found, man was an inhabitant of our planet, with animals either now extinct or only found in warm latitudes; whilst Professor Hughes, on the contrary, maintains that the evidence relied upon to show the existence of man during the glacial period is far from satisfactory. "Twenty years ago," says Mr. A. R. Wallace, "the antiquity of man as now understood was univer-

sally discredited. Geologists as well as theologians thought that the earth assumed its present condition before the human race appeared upon it. Since then so many discoveries have been made in all parts of the globe that we can hardly wonder at the revolution effected in public opinion. Not only is the belief in man's vast and still unknown antiquity universal among men of science, but it is hardly disputed by any well-informed theologian." He further adds that, "up to the appearance of Mr. Darwin's work in 1859, the belief in the independent creation or origin of the species of animals and plants, and the very recent appearance of man upon the earth, was practically universal. The development of man from some lower animal form is still to some extent disputed," but this controversy he declares to be nearly at an end, since Professor Mivart, the anatomist, and one of the most talented representatives of Catholic theology, adopts it, as regards man's physical structure. "Never, perhaps," he continues, "in the whole history of science and philosophy, has so great a revolution in thought and opinion been effected in so short a time. It has been so great that facts opposed to this conclusion hardly receive their due consideration," amongst which is the fact, that if man be a development from the lower animals, he must be immeasurably older than any traces of him that have yet been discovered, and many other points, to which I have not space to refer.

Whilst upon this subject I may mention that an archæological explorer in Africa calls attention, in a recent letter to an English journal, to the remarkable fact that the earliest known remains of Egyptian art are as good as any of those which follow, and that no inferior remains are found which show any gradation from bad to better, or from better to good; that a recently found statue of a young man and his wife, of a very remote period, in the fineness of the work, equals anything discovered. He pertinently asks the question: If previous inferior works existed where are they?

And as bearing upon this subject and the changes that have occurred since the glacial period, I may state that, in a recent examination of the contents of the stomachs of mammoths found in Siberia, the conclusion arrived at was that these animals lived where their remains have been found, and fed upon plants still existing in Siberia; one of the numerous previous theories being that these animals, which now exist only in very warm climates, were brought down to the Arctic by the great northern Asiatic rivers, near which, or in which, they are found imbedded in the ice.

ARCHÆOLOGY.

Archæological researches, where they relate to the sites of ancient cities, and trace their topography, come within the department of ancient geography. Investigations of this nature have, during the past year, been active, and attended with very interesting results. Mr. E. T. Wood, who spent eleven years in exploring the site of the city of Ephesus, contending with fevers and marauding brigands, and working in pits and trenches almost constantly under water, has, during the year, published a full account of his labors. The German archæologists, Drs. Hirschfeld, Weil, and Mr. Bötticher, have been engaged during the year in making excavations at Olympia, in Greece, which besides clearing the ruins of the temple and laying bare its marble pavements, have led to the discovery of numerous inscriptions, sculptures and other objects of interest. The site of the celebrated temple, which for centuries was a dreary waste, has now, in consequence of these discoveries, become a resort for tourists. Mr. L. P. di Cesnola, who has been absent for three years, continuing his researches in Cyprus, ended his labors last autumn, and is now upon his return to this city. He has discovered the site of Curium, mentioned by Strabo, of which no trace existed. He thought, from the appearance of the ruins, that the city had been destroyed by some convulsion of the earth. He came across a mosaic pavement having columns upon it, and upon removing them discovered a subterranean passage leading to chambers filled with earth, which he first supposed to be tombs, but which ultimately proved to be the treasure chambers of a temple. He explored four of these rooms or chambers. In the first, upon removing the earth, numerous old ornaments were found; in the second all the objects found were of silver, consisting of vases, bowls, armlets, rings, etc.; in the third were vases, statuettes, etc.; and in another every object found was of bronze, copper or iron. They were evidently the votive offerings of devotees, which were kept in these apartments by the priests. He also explored the ruins of Amathus, one of the oldest Phœnician cities in Cyprus, and brought away from it a fine marble sarcophagus, sculptured in high relief with a colossal female head in the archaic Greek style. He identified the great temple of Apollo Hylates, and says that his last three years' excavations have surpassed those of the seven preceding years. Dr. Schliemann has followed up his excavations upon the supposed site of ancient Troy by excavations upon the site of Mycenæ. Mycenæ is the most ancient city in Greece. It is identified with the poems

and personages of Homer, and Dr. Schliemann supposes that he has found the tombs of Agamemnon, Clytemnestra and other Homeric personages. Whether he has or not, he has found and opened tombs which, from their cyclopean structure, belong to a very early period of Greek civilization. His excavations, which have been extensive, disclose the general topography of this very ancient and wealthy city, the monumental and other remains of which he carries back to 1200 B. C., the period to which the Homeric poems are usually ascribed. The articles discovered in the tombs and other places are far more extensive, varied, and of greater archæological value, than those dug up by him upon the supposed site of Troy. They show that glass and iron were in use amongst the inhabitants of this city in very remote times. Two keys and two daggers of iron were found, the keys being of very curious workmanship. Near the Gate of the Lions, in the Acropolis, beneath the ruins of a building, a labyrinth of cyclopean walls, forming many passages, was found. A ring of white onyx, with an intaglio representing animals, was discovered, which, though of very ancient workmanship, is said to be a masterpiece of art. The anatomy of the animals is especially dwelt upon, and the wonder expressed how such a work was possible without the aid of a microscope. Many of the figures painted upon the vases are of Egyptian and Assyrian types, and some have the long Assyrian beards with which we have become so familiar through the sculptured tablets excavated at Nineveh. A remarkable discovery in the tombs was made of two skeletons covered with about five kilogrammes (eleven pounds avoirdupois) of pure gold, with the most wonderful archaic impressed ornaments. "In respect to the human remains discovered," Dr. Schliemann says, "the bones which I found are like the bones of giants of extraordinary size, and the teeth are very large." Numerous articles in gold and silver, some of them very valuable and of exquisite workmanship, are among the treasures discovered, showing that at that early period these metals were skilfully worked. Only three inscriptions were found, which the Rev. A. H. Sayce, of Oxford, one of the highest authorities, was unable to decipher.

Mr. W. E. Robertson recently visited the site of ancient Carthage. A mile or two from the Tunis railroad he came upon the foundation of a wall three feet broad, and following it for three miles reached plowed ground covered with broken marble columns and heaps of ruins crumbling to decay. These fragments, with the remains of reservoirs and the aqueduct, which was constructed of

enormous blocks of stone on a scale of great magnificence, is all that uow exists of the city of Hannibal. The lovely situation of the city, he says—standing on a prominent headland, against which the waves of the Mediterranean beat—captivated those who ultimately became its conquerors, and accounts for the site of the present city of Tunis, in a situation where it is less accessible to foreign invasion. A Mr. Laurie has also visited these ruins during the year. He says that nothing has been done in the way of excavation, except by the French on the site of the Temple of Æsculapius, to the depth of twenty-five feet, and that, in his opinion, a great deal may yet be done by excavations.

In giving an account of geographical labors in different parts of the world, I shall begin with what has been done in our own country.

UNITED STATES.

The surveys, explorations and other governmental work of the United States of a geographical character have been more limited than usual this year, from the late period when the requisite appropriations were passed by Congress, as well as from the smallness of the amount allowed in certain departments. The principal reports have not yet been printed, but I am able to give a brief statement of what has been done upon information courteously communicated to the Society by the various departments at Washington.

THE COAST SURVEY.

In the Gulf of Mexico, careful soundings and observations upon the temperature of the water and the flow of the currents were made by the Coast Survey, which will throw much light upon the course of the Gulf Stream. The trans-continental triangulation was pushed eastward from the Pacific Coast Ranges to the Sierra Nevada, some of the triangles observed having sides of over 150 miles long. The explorations in Alaska, I regret to say, were not continued, in consequence of the smallness of the appropriation allowed for the survey this year.

HYDROGRAPHIC BUREAU.

Lieutenant Commander Green, of the Hydrographic Bureau, has made a most valuable series of telegraphic determinations of longitude, for the purpose of correcting our charts of the West India Islands, one point, at least, having been accurately located on each island.

UNITED STATES ENGINEER CORPS.

The survey of the lakes by the United States Engineer Corps has been carried on by Gen. C. B. Comstock. The excellent triangulation along Lakes Ontario, Erie and Michigan has been continued, the topography of the Niagara river completed, and many points determined for the State survey of Michigan. One of the most interesting results of the survey is a new determination of the elevation of the great lakes. They find Lake Ontario to be 247.25 feet, and Lake Erie 573.58 feet above mean tide at New York, which corresponds almost exactly with the results reached by Mr. Jas. T. Gardner, three years ago, by a different method. The improvement of the South Pass of the mouth of the Mississippi river, according to the plans of Capt. Eads, C. E., for the construction of jetties and other auxiliary works, has also been carried on; but I am unable to gather from such reports as I have seen if the present progress of the work indicates whether it will or not, when completed, be sufficiently permanent and effective to maintain, for all future time, the improved channel.

Col. Wm. A. Ludlow's report of his reconnoissance from Carroll, Montana, to the Yellowstone National Park, has been published. It embraces a description of the remarkable cañons, the geysers, the best routes of travel, geographical positions, and other interesting information respecting the natural history and geology of the region. Lieut. E. H. Ruffner's valuable report on lines of communication between Southern Colorado and Northern New Mexico has also been published by the Chief of Engineers, together with a sketch by Lieut. Mallory of a topographical reconnoissance in Arizona, as well as an account of the work of the engineers attached to the columns of Gens. Terry and Crook, written by the officers in the field, and the geological and geographical explorations under Mr. Clarence King, is about to be issued.

LIEUT. WHEELER'S EXPEDITION.

The geographical explorations and surveys under Lieut. Wheeler, west of the 100th meridian, have been continued. The corps went late in the field. They were distributed into several parties, and their explorations and surveys were carried on in Nevada, New Mexico and California. About 25,000 square miles were traversed by the different parties during the season, about 9,000 square miles of which were in New Mexico, south-east of Santa Fé. It is a region of elevated table-lands, mostly adapted for grazing purposes, about six

per cent. being covered with timber. Before the party making this survey left the field the mercury fell to 16½° below zero, a low temperature for that region. Some interesting Spanish mines were found by them.

Another party made a plane table survey of Virginia City, in Nevada, and the map of it, on the scale of 500 feet to the inch, is in progress. Another portion of the Nevada section surveyed about 6,000 square miles in the central part of the Carson desert and the regions east of it. A survey was also carried on in the neighborhood of Lake Tahoe, in California. The depth of Lake Tahoe was found to exceed 2,200 feet. This party report that the magnificent forests of the Sierra Nevada, in that neighborhood, are being felled so rapidly to supply timber for the miners that in twelve years there will be no timber left for many miles.

Lieutenant Bergland completed the examination of the Colorado river, with reference to determining the practicability of diverting it from its channel to irrigate the deserts of south-eastern California, a project to which I have so frequently referred. The lowest part of this desert, the Coahuila valley, is 200 feet below the sea. It was found that south of the United States boundary, in Mexican territory, a canal from the river westward of this valley is practicable, and would flood an area of 1,600 square miles; but constantly shifting sands would make it a continual expense, and the water flowing in the Colorado river in the dry season is not as much as would evaporate from the surface of such a lake. There is no doubt, however, that when a dense population warrants such an expensive undertaking, that a large part of the Coahuila valley might be irrigated and made productive thirty miles south of the United States boundary. Lieutenant Bergland examined a group of miniature mud volcanoes in active eruption, throwing up liquid mud and emitting sulphurous vapors.

Thirteen atlas sheets of Lieutenant Wheeler's survey have been issued, and six more will soon be ready. They are upon a scale of eight miles to the inch, and cover a large part of Nevada, Utah, Arizona, New Mexico and Colorado.

PROFESSOR HAYDEN'S EXPEDITION.

The United States Geological and Geographical Survey of the Territories, under Professors Hayden and Powell, was carried on. Professor Hayden did not take the field until August. Mr. A. D. Wilson's triangulation party travelled nearly 2,000 miles, making a com-

plete circuit of the new and great mountain State of Colorado; but the remaining parties confined their labors to the sandstone plateau region, lying between the granitic ridges of the rocky chain and the great Colorado river, whose upper course is called the Green river. A few rivers, draining the western slope of the Rocky chain in these latitudes, run westward to the Green river, cutting deeper and deeper cañons into the horizontally bedded rocks as they approach their mouths. Between these rivers are lofty, waterless table-lands, intersected with gorges and cliffs almost impassable. A few stunted trees on the higher parts hardly relieve the ashen hue of this verdureless waste, while the gigantic monuments and figures into which the cliffs are often worn, add to the effect of the mysterious fissures. Large veins and springs of asphaltum, and great deposits of coal of an inferior quality were found, but no traces of "the cliff-building people" were discovered on these plateaus north of latitude 37° 45′.

Wilson's party, before referred to, climbed and measured Blanco Peak, near Fort Garland, in Colorado, which is the highest peak in the Rocky mountains. It is 14,464 feet high. The most elevated peaks of the Rocky mountains are in the State of Colorado, but as there are over fifty that range from 14,000 to 14,500 feet, it has required much examination and care to determine which is the highest.*

To scale these lofty heights is a task of great difficulty, and the ascent of Blanco Peak by Wilson's party was, in view of the peril encountered and the obstacles overcome, a remarkable achievement in mountain climbing. After many and severe trials they reached the summit, when one of the most magnificent views in all Colorado was spread out before them, the greater portion of Colorado and of New Mexico being embraced in the field of vision.

Owing to the lateness of the appropriation, this branch of survey was confined in its labors chiefly to the completion of the Atlas of Colorado, a work upon which they have been engaged since 1873. Six sheets of the Physical Atlas will be issued within the next few months, each embracing 11,500 square miles, or a total of 70,000 square miles.

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* NOTE.—How near in height the principal peaks are will appear from the following statement: Blanco Peak, 14,464 feet; Mount Harvard, 14,384 feet; Gray's Peak, 14,341 feet; Mount Lincoln, 14,286 feet; Mount Wilson, 14,280 feet; Long's Peak, 14,271 feet; Uncompahgre, 14,235 feet; Pike's Peak, 14,146 feet.

PROFESSOR POWELL'S EXPEDITION.

The main corps of Professor Powell did not leave Washington until early in August. They proceeded to the town of Gunnison, in Utah, and there organized six field parties, under the direction of Professor Thompson—three geographical, two geological and one photographic.

Eastern Utah was surveyed from the Colorado river to the Wasatch mountains, and over these mountains, between parallels 38° and 39° 15′.

The characteristic of the region surveyed is great plateaus, with lines of cliffs bounding them, which are from 1,000 to 2,000 feet high, and which vary from twenty to 200 miles long; the whole region being intersected with a net-work of deep, narrow cañons, with vertical walls, that present nearly impassable barriers to travel. The only streams are in the bottom of these cañons. Land capable of irrigation, in any considerable body, is to be found only along the valleys of the Green and San Rafael rivers. Agriculture is impossible without irrigation; and of the 7,000 square miles surveyed, about four per cent. only can be irrigated, and but one per cent. made available, without a large outlay of capital for dams and canals. A scanty growth of pine and spruce covers about five per cent. of the area, the remaining lands being a desert waste. There are large quantities of excellent coal, but no precious metals were discovered. The average elevation of the region is about 7,000 feet, and the highest peak—Mount Ellen, in the Henry mountains —is 11,500 feet. Snow fell early in October, and the surveying party in the latter part of the month forced their way through it with difficulty.

Another party surveyed about 4,000 square miles in south-western Utah and south-eastern Nevada, one of the most rugged and barren regions in the whole of the great basin. It is not, like eastern Utah, a country of plateaus, but is marked north and south by ranges rising to 9,000 feet, with broad desert valleys between. No considerable bodies of timber lands, or lands capable of irrigation, were found, and only the small proportion of half of one per cent. possesses any value, either for agricultural purposes or woodlands. Part of the remaining lands afford pasturage, but it is of the poorest quality. The climate is very dry; the annual rainfall does not exceed four inches; and although the average elevation is about 5,000 feet, the climate is much milder than that of eastern Utah. The surveying party remained until the middle of December with-

out encountering any snow storms. There is no coal in this region, but it is known to contain large amounts of silver. The well-developed mining district of Pioche was within the region examined, and also a newly organized district of Leeds, in the Virgin river, Utah, where silver, instead of occurring in veins, is disseminated, in the form of horn-silver, through a stratum of sandstone belonging to the Jura Trias. Between 4,000 and 5,000 men have gathered at this last named district (Leeds) within the past few months.

The entire area of 11,000 square miles was visited by the geological and triangulation parties.

During the greater part of last winter, and in the spring, J. K. Hillers, the photographer, and O. D. Wheeler, C. E., were in the province of Tusayan, in northern Arizona, one of the towns of which is known as Moqui. They made plans of the villages on a large scale, and took a number of photographs of important and striking localities, and of objects connected with the industry and arts of the people. The people of Tusayan are the best preserved remnant of the Pueblo race, the ruins of which race cover Arizona, New Mexico, Colorado and Utah, and extend beyond these territories north and west. No trace of any metal was found, except such as had been introduced by the whites. The native arts are more highly developed here, and more varied, than among any other family of tribes north of Mexico; and neither in their architecture nor in the domestic arts is there any indication of their having degenerated from a more advanced state.

The collections made embraced totemic carvings and paintings, pottery, stone implements, clothing, ornaments, food, furniture and manufactures.

SMITHSONIAN INSTITUTION.

Under the direction of this institution, Judge J. G. Swan, of Portland, Oregon, has made a very interesting collection, illustrating the arts and industries of the Indian tribes, both of western Oregon and Washington Territory. Among the objects obtained are carved and painted wooden columns, varying from twenty-five to forty feet in height. The devices which are carved or painted upon them represent the totemic history of the ancestors of the chiefs. These columns, of which there were specimens at the Centennial Exhibition at Philadelphia, have hitherto been supposed to be idols, but they are now known to be heraldic—an interesting fact, showing the perfection reached in heraldic

devices among people living in the savage state on the shores of the Pacific. The tribes who erect these heraldic columns live upon the mainland, east of Vancouver's Island. They inhabit communal dwellings holding from 100 to 300 people, and these totemic or heraldic columns are erected in front of the dwellings. They make their house of slabs split, or, more properly, riven out of great tree-trunks with wooden wedges and stone mallets. Judge Swan also obtained canoes sixty feet in length, dug out from single logs.

INDIAN REMAINS.

On the islands along the southern coast of California Mr. Schumacher collected, for the national museum at Washington, many tons of ancient stone implements and domestic utensils, as well as pottery. They are remarkable as exhibiting an amount of skill and taste beyond anything of a like character that has been found in North America. The collection embraces vases, jars, bowls, pitchers and mortars of stone, stone knives, lances and arrow-heads of exquisite workmanship. The stone instruments, it is thought, surpass in beauty of finish any aboriginal remains of a like nature heretofore discovered in any part of the world. They were found in graves that date from before the arrival of Europeans and up to a very remote period.

Under the direction of Prof. J. W. Powell, Mr. S. Powers traveled through California, making vocabularies and collections for the national museum at Washington, to illustrate the languages, arts and industries of the multitudinous tribes of that region. Besides many other interesting things, he secured over twenty models of Indian dwellings and their appurtenances, together with plans of Indian villages. A very interesting feature is a collection of the foods used by these tribes prior to the arrival of the whites. It also embraces implements of war, hunting, trapping, clothing and ornaments.

UNITED STATES LAND OFFICE.

The land office has published a valuable atlas of the Western States and Territories, based upon the rectangular surveys and boundary determinations executed under the direction of this department, and also a new edition of the large wall map of the United States.

UNITED STATES SIGNAL SERVICE.

This corps, under the able direction of Gen. Albert J. Myer, is making rapid advances toward a complete knowledge of the condi-

tions and causes of the American climate. They have nearly completed the most extensive collection of altitudes of places in North America which has ever been gathered. The list includes several thousand profiles, representing almost every railroad and canal, and from this and other data they are making a relief model of North America on a large scale. A telegraph line has been built by them from Central Texas across the Llano Estacado, that dreaded waterless desert, and one across the high and arid plateaus and ranges of Southern New Mexico and Arizona to San Diego, on the Pacific. This gives an unbroken line from Savannah along the southern border of the United States, stretching from ocean to ocean. Thirty meteorological stations are placed along the line, the highest being 6,800 feet above the sea. Another line of stations follows the Rio Grande river from its mouth to the elevated plateau of Colorado.

The Mexican telegraph lines now extend from the mouth of the Rio Grande river to San Luis, thence to Tampico, and thence through Vera Cruz along the coast nearly to the extremity of Yucatan, and the signal service are preparing to place stations down even to Yucatan. The Gulf of Mexico has been nearly encircled with a telegraph line, along which meteorological stations will be placed at such short intervals that no hurricane or storm can move from the gulf without notice of its escape and the direction of its flight being given at once to the whole country.

Arrangements have been made for a chain of stations to the extreme eastern end of the West Indies, all connected by telegraph with the Washington office. If Congress is wise enough to give sufficient appropriations to carry out these excellent plans, it will be impossible for any hurricane to enter the United States from the south unheralded, for hourly bulletins of its progress can be posted in every seaport. Who can estimate the lives and treasure that such an arrangement may save? Congress cannot be too generous to the signal service.

To show the power of the telegraph in this connection, I may mention that Gen. Myer recently sent, at 12 o'clock at night, an order to each meteorological station in this country. It was unexpected by the corps, but so perfect is the discipline, that within ninety minutes the Washington office received answers from every station, even including those on the lofty elevation of Pike's Peak and the lonely desert of Fort Yuma.

At Gen. Myer's suggestion, an international meteorological or-

ganization was effected in 1873. Observations are now taken once a day, *simultaneously*, at every meteorological station in the world, and the results forwarded to the signal service office at Washington.

Every day this office publishes a bulletin, giving the record of these simultaneous observations from all stations. The date of the bulletin is necessarily long enough after the observations to admit of their reaching Washington. The climate of the world is thus placed under our eyes at once, and when this is carried to perfection, the laws that govern climate may be determined.

PETRIFIED FOREST IN NEVADA.

Mr. D. Rideau has examined a petrified forest in the desert of north-western Humboldt, in Nevada. He found the stumps of the trees now transformed into rock, in an upright position, with their roots imbedded in the soil as when growing—many of the stumps measuring from fifteen to twenty feet in circumference; and found the ground strewn with trunks and limbs in the same petrified state, retaining their natural shape and size. There were no living trees, nor any trace of vegetation in the vicinity, except a growth of stunted sage brush.

The largest tree yet found in California was discovered during the year in Kings River Valley, Fresno county. Measured from the highest point to which a man could reach, it was found to be 150 feet in circumference, within a few inches, and its height was estimated at 160 feet.*

BRITISH AMERICA.

The boundary line between the United States and Great Britain, from the Lake of the Woods to the Rocky mountains, was established by treaty in 1818; but as difficulties arose from the establishment of British trading posts at points claimed by the United States to be within our line, an international commission for the survey of the exact line was agreed upon by both governments, which commission commenced its labors in 1872. Capt. J. Anderson, R. E., has, during the year, given an interesting account to the Royal Geographical Society of the result of their labors. The country between the Lake of the Woods and Red river was surveyed in the winter of 1872–3. It was a *terra incognita*, hitherto unexplored by white

*The statement of the height is probably a mistake, for the *Sequoia gigantea* of California runs from 275 to 350 feet in height.

men, and was found, as the Indians represented it, to consist mainly of swamps, making the work of the survey a very difficult one, which had to be conducted chiefly in the winter, when the swamps were frozen, and with the thermometer at 45° below zero. It was an arduous task, and the observer would occasionally find his eye-lid frozen to the eye-piece of his instrument. The least wind caused great suffering, and on the march the eye-lids of the men would often be frozen together. Of the country west of the Red river little was previously known. In every direction the old paths of the buffalo were seen, with their remains scattered about, showing it to have been once a region where vast numbers of them grazed, but during the last sixteen years they have been driven back 200 miles to the westward. It would be still a fine grazing ground, he says, were it not for the myriads of mosquitoes, which drive domestic animals almost wild and keep the strong ones from gaining flesh. In one direction the boundary line, in the course of thirty-five miles, crossed sixty-five pieces of water, twenty-five of which were lakes, requiring a survey by triangulation. In 1873 the survey was carried on to Turtle mountain, a district, Capt. Anderson says, invaluable to settlers. Beyond this it was extended over the Great Plains for 138 miles. The constant mirage on these plains caused great delay, for in looking through the telescope at a distant flag-staff, it would dance with persistent contortions. The general level is not disturbed for 120 miles west of Turtle mountain. By October of 1873, 400 miles of the boundary were surveyed, embracing the great coteau of the Missouri, the salt lakes and the arid and desolate country known under the familiar name of La Mauvaise Terre. During the summer of 1873 the great plains were swept by fire, and the explorers exposed to much peril. They were also involved in the great snow storm of 1873, which continued uninterruptedly for several days, and by which so many lives in the west were lost.

In 1874 the survey was carried to the Three Buttes, a mountain range with peaks 6,800 feet high, and from there to the base of the Rocky mountains, where these mountains rise abruptly from the plain in precipitous peaks 10,000 feet high. The whole boundary from the Lake of the Woods to this point, is now marked by stone cairns or earthen mounds; and by iron pillars, at intervals of a mile, for 135 miles along, and marking the boundary of Manitoba, in British America, which Capt. Anderson says "is destined to become the great granary of the dominion, from its enormous agricultural capabilities." There are, however, the drawbacks of the want of

market, the ravages of the grasshoppers and the scarcity of fuel, The latter difficulty can be obviated by the planting of trees and by developing the great bituminous coal fields of the Saskatchewan ; and although the grasshopper has prevailed for the last four years, it was not found in the region for thirty-six years previously. Emigration in this direction is steadily going on ; 4,000 Mennonites from Odessa, in Russia, have settled there, and also a colony of 300 Icelanders on the western shores of Lake Winnipeg, who are well-satisfied with their new home.

ARCTIC.

The Arctic event of the year has been the return of the English expedition, the Alert and the Discovery, under Sir George Nares, from the attempt to penetrate the Pole by the way of Smith's sound. To a voyage like this, the details of which, in the report of Sir George Nares, occupy forty-five columns of an English journal, I can refer only in the most general manner. The vessels had great difficulty in forcing their way through Smith's sound and Kennedy's and Robeson channels. It required the greatest care, incessant watchfulness and the most skillful seamanship. The Polaris, in Hall's expedition, sailed with little or no obstruction from ice up to 82° 16′ north latitude, where her further progress was impeded by heavy ice floes. The Alert and the Discovery, on the contrary, were twenty-five days making their way from Cape Sabine to Discovery bay, a distance of only 250 miles, during which time both vessels narrowly escaped being nipped, to say nothing of other hairbreadth escapes, and they were about twenty-five days upon their return in making the same distance.

Regarded from a geographical and scientific point of view, the expedition was a success. I said in my annual address several years ago that to reach the Pole was not the main object in an Arctic expedition ; that that was a mere geographical feature, to which necessarily great *éclat* would be attached ; but that the real object of such an expedition was to explore the Arctic region in every direction; as far as possible to obtain scientific information in a quarter of the globe where it was of the highest interest, not only as respects the past physical history of the earth, but to enable us to unravel phenomena and obtain a knowledge of physical laws affecting its present condition which are of high scientific value, or, to express it in a popular form, of the greatest practical importance. This object has been to a considerable degree advanced by the English expedition. The

Alert not only attained the highest latitude, 82° 24′, ever reached by a vessel, and the sledge expedition under Commander Markham the farthest northern point attained by man, 83° 20′ 26″ N. lat.; but the expedition, in an unknown region, discovered and traced a line of coast extending over nearly 38° of longitude, ascertained to a considerable extent the nature of the Polar sea bordering this newly discovered coast, and collected a large amount of scientific information in the examination of both land and sea. Commander Aldridge explored a line of coast for 230 miles west of the spot where the Alert wintered, ninety miles of which trends north-westerly to Cape Columbia, the extreme northern cape, 83° 7′ N. lat., 70° 30′ W. long., thence westward for sixty miles to 79° W. long., and from there gradually south to 82° 16′ N. lat. and 83° 33′ W. long., with no indication of land extending from there either westward or northward. Commander Beaumont, with his sledge party, traced the north-west and northern coast of Greenland from Polaris bay to a point east of Mount May in 50° 40′ W. long., where he sighted the farthest northern land seen in the expedition in 82° 54′ N. lat., and 48° 33′ W. long. (Cape Britannia and Mount Albert), and found that the Greenland coast runs from Mount May, in a south-easterly direction, to below the eighty-second parallel of north latitude, whilst Lieut. Archer explored Lady Franklin's bay, and Lieut. Fulford and Dr. Coppinger Peterman's Fiord and its vicinity, to which must be added magnetic and meteorological and other scientific observations carried on in the winter, with the thermometer ranging at one time at 73° below zero, and the labors of the naturalist. All this was accomplished in the face of the greatest obstacles and in the most trying circumstances with a cheerfulness, courage and perseverance on the part of both officers and men which is beyond all praise.

Being farther north than any former expedition, they passed an unparalleled Arctic winter of 142 days, nearly five months, without the light and heat of the sun, and endured the severest cold yet known. In the sledge expedition of Commander Markham, in the autumn of 1875, to Cape Joseph Henry, the fall of snow was so enormous that the men had to draw their sledges through it up to their knees, and frequently up to their waists, so that out of a party of twenty-four twelve were severely frost-bitten, and three suffered amputation of limbs.

In an attempt to communicate by a sledge party with the Discovery, that vessel having wintered below in Robeson channel,

Christian Peterson, the Danish interpreter from Upernavik, who had been Dr. Hayes' sledge driver, became so exhausted that nothing would keep him warm. They were consequently compelled to go back with him, and the poor fellow died shortly after his return to the vessel.

In Commander Markham's expedition in the following April across the Polar sea north, in the direction of the Pole, the men had not only to draw their sledges, but two heavy boats, fifteen and twenty feet long, over rugged floes of ice, separated by ridges sometimes thirty feet high, to make their way over the debris of the pack-ice broken up by the previous summer, and refrozen during the winter into chaotic, rugged masses of angular blocks, of every possible shape. They had frequently to cut their way with picks, through the hummocks; and such were the contortions and checks, that they had frequently to go five times over the same ground; so that in making a distance of seventy-six miles toward the Pole they actually traveled over 276 miles. Each man had to drag 236 pounds, and to work from ten to twelve hours a day. They could pull but a few feet at a time, and make but from one and a quarter to two miles and three-quarters a day. They were absent on this sledge expedition, engaged in this incessant labor, for two months and a half; and, to add to their trials, the scurvy broke out amongst them, so that, when relief reached them, out of the seventeen of the party only five were able to drag the sledges. Commander Beaumont's sledge party along the north coast of Greenland, were beset with like difficulties. Enormous blocks of polar ice had been pressed against the shore, making the traveling one of incessant labor, so that seven days were occupied in moving only twenty miles. The scurvy also broke out with them; and when they came in, two only, Commander Beaumont and the quartermaster, were able to draw the sledges. The western sledge party, under Lieutenant Aldrich, found the same heavy ice extending along the whole coast. They were also attacked by the scurvy, Lieutenant Aldrich being the only one who escaped; and relief fortunately reached them the last day that most of them were able to travel.

Sir George Nares attributes the breaking out of the scurvy to the incessant labor to which the men were subjected in sledge parties. Had there been no sledging, he says, there would have been no scurvy. The order of the admiralty was to remain two years; but by remaining, says Sir George, "I could only explore Grant Land to the south

and Greenland to the north-east. A lengthened journey over the Polar pack with sledges and navigable boats is impracticable at any season, and with my whole resources I could only hope to reach about fifty miles beyond the point to which we had attained. My men had recovered from the scurvy, but could not be employed further on extended sledge journeys, and I, therefore, concluded to return"—a decision which has been approved by the admiralty. As a commander he was incessant in his care and watchfulness, and acted with great skill and judgment in the trying difficulties by which he was beset. He carried his own vessel to the highest point ever reached, and he and Captain Stephenson brought both vessels safely back on a return passage, which was one of great difficulty and trial.

But, whilst entertaining the highest opinion of the capacity, skillful seamanship, energy, prudence and judgment displayed by Sir George Nares in the command of this expedition, I regret to say that I cannot pass, without animadversion, certain matters in his report and in his address to the Royal Geographical Society.

One of the most gratifying things in the history of geographical exploration is the courtesy and kindliness with which, almost uniformly, subsequent explorers, especially in the Arctic, refer to the labors and discoveries of their predecessors. This is not only wanting on the part of Sir George Nares, but the only reference made to Drs. Kane and Hayes, the earliest explorers of the upper part of Smith's sound, is to speak of them unfavorably—to say that each of them published very misleading delineations of the coast, and to charge them with altering the names of the headlands discovered by Admiral Inglefield. In the absence of a statement by Sir George Nares of any particular facts in support of this general and condemnatory reference to both of these explorers, I feel called upon to say something upon the subject.

Dr. Hayes has answered for himself in a communication to the New York Herald, declaring that had Sir George examined the doctor's map, published by the Smithsonian Institution, he never would have made this assertion. Dr. Kane is dead, but I think I can state correctly what he did. Up to Cape Sabine on the west and Cape Hatherton on the east he recognized and retained the names given by Admiral Inglefield, but beyond these points names were given to the headlands, as they did not in any way correspond with the position of lands as they appear upon Admiral Inglefield's chart. Dr. Hayes, however, in his subsequent voyage, restored sev-

eral of Admiral Inglefield's names upon the western coast. Having known Dr. Kane well and knowing Dr. Hayes intimately, I am confident that neither would designedly obliterate names to appropriate to themselves the laurels of a prior discoverer. In this connection it may not be inappropriate to recall the well known fact that the name of Grinnell Land, in Wellington channel, discovered by De Haven in the Grinnell expedition, was for some time omitted upon English maps, and afterwards an English name was given to it, which I refer to simply to suggest the application of the homely proverb indicating what those should avoid who live in glass houses.

In respect to the complaint that their delineation of the coast line was misleading, it is to be remembered that Dr. Kane's and Dr. Hayes' expeditions were private enterprises, fitted out with a comparatively small sum of money, which in neither case exceeded $25,000, and that these expeditions were deficient in most of those appliances which are deemed requisite in Arctic explorations, both for nautical and scientific purposes. They went in small, frail sailing vessels—one being but 144 and the other 133 tons—to explore an unknown region, and, as I know, with very little public encouragement, for a large part of the expense had to be borne by themselves. Both, though young and inexperienced, proved to be able commanders. Neither were professed seamen, and, therefore, in the tracing and delineation of coast lines are not to be contrasted with trained naval officers, and yet what they accomplished, when the inadequacy of their means is considered, was very remarkable, and well worthy of the recognition it received from scientific societies and governments, both at home and abroad.

Kane reached to nearly 81°, Hayes nearly to 82° N. lat., and Hayes made a sledge journey of 700 miles, which was greater in length than any sledge journey in the recent expedition, and, from the few men that he had, it involved quite as much physical exertion. Dr. Peterman has truly said that justice has never been done to Dr. Hayes' achievements in the Arctic regions.

Let us now contrast with this the expedition of Sir George Nares, which cannot be better described than by quoting his own words in a speech at a banquet given to him and his officers in England before their departure:

"Permit me to say that no similar expedition has ever quitted the shores of this or any other country *as well prepared as we are.* Our ships are excellent, our equipment perfect, and we have all the

resources that we could reasonably hope for. Our officers and our men have been chosen with great care from among a great number of volunteers. They depend each upon the other, and their whole heart is in the work. Our route is well traced, our instructions given with extreme precision, and we set out with all the dearly-bought experience of other expeditions," closing with the remark, that "Now that England has resolved to take part in these enterprises, success is certain."

After this, how strangely does it sound to hear him complain, on his return, of the deficiencies of the coast line as given by explorers who went into Smith's sound without any maps at all.

His expedition was directed to remain two years; to attempt to gain the highest northern latitudes, and, if possible, to reach the Pole. It returned in one year, without accomplishing as much as was expected. While it may be freely admitted that they did all that they could, and, with a crew enfeebled by scurvy, were justified in returning without attempting to do more; still, having failed to achieve all that was hoped for by themselves, by the government that sent them, and by the world, a simple statement of the facts and the conclusions arrived at was what was to be expected on the part of the commander, in a report which was necessarily, to a certain extent, apologetic and explanatory, without seeking to impair the value of the prior labors of Dr. Kane and Dr. Hayes. The manner in which they are referred to, is by a passage in which even more is implied than is expressed. The effect of it upon the general reader is to convey the impression that their expeditions were of little, if of any value, and to give more point to it, in Sir George Nares' address before the Royal Geographical Society, Captain Buddington is highly commended and a statement made in respect to him that is wholly without foundation. "He would," says Sir George, "if he had not been overpowered by a majority, have informed us of the Polar ice long ago, and we all look upon him as a very hardly used man." Now, so far from there being the slightest ground for such gratuitous suggestion as this, Captain Buddington, upon his return, stated his views very freely to all. He did so to me and publicly before this Society, in one of the largest assemblages ever convened in a public hall in this city, and at my personal request he put them in writing in the form of a communication to the Society, which we published at the time and which will be found printed in our journal of that year. Nor can I perceive how he could have given information respecting the Polar ice which Sir George Nares saw and studied in the Polar

sea, as he was never there. He says, in the communication referred to, that they were stopped at 82° 16′ north latitude, by "old heavy floes," but of the state or nature of the ice beyond that, except so far as it was within the range of his vision, he knew nothing.

The return of the expedition and its results, have given rise to a great deal of discussion, both in this country and in England. Sir George Nares is of opinion, and Dr. Peterman, in a recent letter, concurs with him, that any further attempt to reach a higher latitude by the way of Smith's sound is hopeless, and that any future effort must be by the route between Spitzbergen and Nova Zembla. I fully agree in the correctness of this judgment, so far as respects any attempt to get farther north by the way of Smith's sound in a vessel. I have never found sufficient facts to lead me to believe that there is an open polar sea that can be reached by a vessel, nor any physical reasons why there should be a great space of open water at the Pole or in its vicinity. This belief is a very old one. The supposed sea is to be found represented upon a map published 268 years ago. There may possibly be such a sea. The knowledge we possess will not warrant the assumption that it does not exist ; but it will warrant this statement—that the more we become acquainted with the area of the polar basin, and the nearer we get to the Pole, the less indications there are of the existence of such a sea. I am not, therefore, very hopeful that any vessel will be able to get much farther north than vessels have already attained ; but I do believe, notwithstanding the result of the English expedition, that the Polar area can be traversed much farther north in that direction by sledging, and that it can be done by the way of Smith's sound as effectually as between Spitzbergen and Nova Zembla. The plan which Dr. Hayes laid before this Society eight years ago, of establishing a station at Port Foulke, where subsistence can be easily obtained, and with which communication can be regularly kept up by sea, as a base from which expeditions may be directed to the north as favorable opportunities offer, I have always thought the best plan of polar exploration, and for many reasons preferable to sending out large expeditions. It would not require a large force, would afford opportunity for the training and experience in the Arctic regions which is requisite, and could be kept up at a comparatively small expense ; renewing the force, if necessary, after two years, which is as long as men are able to labor in the Arctic. Capt. H. W. Howgate, of the United States Signal Service, has recently called public attention to a plan substantially of this character, and a bill embodying his suggestion is

now before Congress, to establish a temporary station for the purpose of exploration at some point north of 81° N. lat., on or near the shore of Lady Franklin's bay; and Capt. I. L. Norton, a shipmaster who has had some experience in the Antarctic, is maturing a like plan, which he advises me he will lay before this Society.

CENTRAL AND SOUTH AMERICA.

INTER-OCEANIC SHIP CANAL.

The several surveys instituted by our government across the American isthmus, to ascertain the most feasible route for the construction of an inter-oceanic ship canal, have been completed, and although all the reports have not yet been published, it is understood that the result of the surveys shows that the Nicaragua route is the most practicable. It will take ten years at least to construct it, and the cost is estimated at about ten millions of dollars. The Department of State, it is said, is now in correspondence with various friendly powers for the negotiation of treaties guaranteeing the neutrality of the canal; for a work of such magnitude must be constructed by governments that will participate in the undertaking. Intelligence has recently been received of the arrival in the Bay of San Miguel of the French expedition sent out by the Commission de Géographie Commerciale of Paris for the survey of a route, but what route or routes they propose to explore I am not advised.

Mr. A. Le Plongeon, who, it will be remembered, some years ago read a paper before this Society, has been engaged during the year in exploring the ruins of Yucatan, and has sent to this city 200 interesting photographs. He was interrupted in the prosecution of his researches by an insurrection among the people, and when heard from last month had taken refuge upon a small island upon the coast (Isla de Mujeres) to which he escaped in a boat. He writes that upon the coast, about six miles distance from his place of refuge, are the ruins of an ancient city, formerly known as Ekab, but now called Ineco, the ruins of which were distinctly visible through the spy-glass. He says that at the time of the conquest it was reported to be a large city, that the ruins have never been explored, and that that part of Yucatan is now occupied by a race of Indians who are exceedingly hostile, and put to death any white man who comes within their power. With American pertinacity, he declares that he

means, nevertheless, to go there; that he is not afraid of the Indians; that he hopes to be able to learn all about this ancient city, and obtain photographs of the remains.

J. G. Lobato has been engaged, during the year, investigating the meteorological conditions of the valley of Mexico, and Commander Muster, R. N., has been occupied in fixing the position of various places in Bolivia, and correcting the geography of the Amazon.

A cavern has been found in Cuba containing Carib remains, indicating that the whole of that island was formerly inhabited by the Caribs.

Prof. Wiener has been occupied during the year in ethnological researches in South America, and reports from Pachacamac that he has discovered glaciers in the Andes of Chili, which had been questioned by Agassiz; and Prof. Hartt, chief of the Brazilian survey, is reported to have recently made important geological discoveries in Brazil. The government of Brazil has undertaken the measurement of an arc on the parallel of 28° S. lat., extending over nine or ten degrees of longitude, connecting the capital of the country with the great meridian of Brazil.

The Amazon is now navigated by steamers 3,000 miles from its mouth, and several of its tributary rivers have been opened up to steam navigation. I would especially call attention to the great commercial importance to the United States of direct and regular communication from this country by steam with the mouth of the Amazon, in view of the importance of the regions of the upper Amazon and its tributaries, which are now made accessible by steamers.

EUROPE.

The initiatory steps have been taken for the measurement of an arc of the meridian parallel with Algeria, the only remaining work being the determination of the position of Nemours by careful astronomical and terrestrial observations.

The surveys in Austria have been actively prosecuted; 2,066 square miles have been surveyed in Galicia and Hungary, and 200,000 altitudes determined. Seventy-three sheets of the new map of Austria have been completed, which includes the whole of the Tyrol, the greater part of Transylvania, and parts of Lower Austria and Bukowina.

The surveys in Turkey and Greece have been carried on, and promise at an early day, a good map of the Balkan peninsula. Signor

H. di Gubernatis, after spending six years in the survey of the Epirus, has prepared a very valuable map of the ethnological distribution of the Epirus of the Greeks, Albanians and Wallachians.

Capt. E. Willie was engaged last summer in the vessel Voringen in making deep sea soundings between Norway, the Shetlands, the Færoes, Iceland and E. Greenland, which is to be kept up for several summers.

ASIA.

The Russians and others have been very active, and have had numerous expeditions during the year in Asia, chiefly in Siberia and North-eastern Asia. My space will admit only of mentioning the names: Lieut. Sandeberg and Prof. Wagner, in the regions around the White sea; M. Grunm, in the country of the Caspian; General Skobleffs, in the exploration and survey of the Altai and Trans-Altai mountains and the northern part of the Pamir; M. Poliakoff, in the lower part of the River Ob; M. Chersky, upon the Irkoort river; M. Rheinthal, from Wjernga to Kashgar; M. Scvertslow, in the valley of Fergani and the neighboring mountains; Mr. Ney Elias, in the valley of the Shueli, in the western part of the Chinese province of Yunnan; M. Potanin, in East and North-west Mongolia; Colonel Prejevalsky, of the region between the Himalayas and the Thian-Shan, China and Turkestan; Dr. A. Wojeckoff, in Japan and Siam; and the Abbé Montrosier, in the exploration of both branches of the Mekong, in Cochin China.

Colonel Bolschef has been surveying the Siberian coast between parallel 45° and 52° N. lat. from Plasten bay to Castries bay. The undertaking was one of great difficulty and hardship. The country was found to be mountainous, the range of Barin traversing the whole coast. The land is watered by numerous streams, flowing through valleys. The soil is good, the vegetation luxuriant, and being close to the coast, is well adapted for colonization. To the north there is a great quantity of fine ship timber, and lead, copper gold, silver and coal were found.

CHEKANOFSKY EXPEDITION TO THE OLENEK.

M. Chekanofsky, to whose previous labors I have frequently referred, explored the lower course of the Lena and the Olenek rivers. The season was too far advanced to enable him to descend to the mouth of the Lena, and after passing down that river some distance, he crossed the country with reindeer to the Olenek, which he descended to its mouth. The object of this journey was geograph-

ical, geological and botanical. Upon encamping at the mouth of the Olenek, facing the dreary waste of waters of the Siberian sea, he found close to his camp two old worn graves covered with lichen, and near them the remains of a cross. Upon inspection, he found an inscription showing that they were the graves of the intrepid Russian explorer Prontschischtschew and his heroic wife, who died and were buried there 140 years ago. Prontschischtschew was a young Russian lieutenant who was sent in a small vessel from Yakutz down the Lena, to attempt the passage by the westward, around the northern coast of Asia, to the mouth of the Yenisei river. When he received his orders for this expedition he had just been married, and his young wife resolved to go with him. He sailed down the river Lena without any difficulty, and passing out of the mouth of that river, sailed westward to the river Olenek, where he passed the winter, and in the spring of the year of 1736 he attempted the passage around the north-western coast of Asia, a region then wholly unknown, and upon approaching Cape Tschelguskin, the extreme northern point of Asia, which has never yet been passed, his vessel became entangled in the ice, which involved all on board in such constant peril, and imposed upon the commander such incessant labor, that he fell ill, and during his illness was so affected by the sufferings of his crew (to whom he had become much attached, and by whom he was very much beloved), that he died. The crew succeeded, after great efforts and peril, in extricating the vessel and bringing her to the mouth of the Olenek, upon the desolate shore of which they buried Prontschischtschew. His wife, overwhelmed by her loss, died a few days after his burial, and was laid in a grave beside him. The crew passed a terrible winter, and in the spring succeeded in bringing their vessel into the Lena, and found their way back to Yakutz.

Chekanofsky, who knew all these facts, tenderly recorded in his journal the discovery of the graves, expressing the hope that the Russian government would mark the spot by a permanent monument, little imagining how soon, to quote a line from Pope, he should "want the generous tear he paid." This learned and energetic explorer was condemned to exile in Siberia, for what offense I know not; and, being a man of high scientific attainments, he passed ten years there in investigating the geography, geology and botany of the country. He returned to St. Petersburg last autumn, bringing back with him extensive collections, chiefly botanical; and shortly after his arrival was found, one morning, dead in his bed. It is said in

the Russian newspapers that he probably poisoned himself, which, unless satisfactorily established, it is hard to believe of this distinguished man, who had returned to St. Petersburg with his collections, to lay before the world the result of his long and arduous labors.

DR. FINSCH'S EXPEDITION TO THE OB AND THE IRTISH.

The German Arctic Society determined upon a plan for polar research by the establishment of scientific observatories, with expeditionary trips and yearly communication, in Siberia; and last summer Dr. Otto Finsch, curator of the Bremen Museum of Natural History, and Dr. A. Brehm, were dispatched for this purpose, accompanied, as a volunteer, by Count Waldberg Zeil, heretofore known by his journey to Spitzbergen with Heuglin in 1870. Last July they reached Obdorsk, the most northern settlement on the river Ob, where they met the Russian expedition, organized for the survey of the Rivers Bar and Chuca, that flow into the Sea of Kara, and the course of the River Ob, to determine the possibility of connecting these rivers with a canal. From thence Dr. Finsch and his party made their way to the Kara sea, a very difficult route; and upon their return last autumn they passed through the Kara sea and the strait without any impediment from the ice, and have transmitted a very interesting account of their journey in Siberia. As they descended the River Irtish, the scenery constantly reminded them of the Rhine, and they found the Ob to be a very imposing river.

I had the pleasure of meeting Dr. Finsch upon his recent visit to this country, and can appreciate that it was a most judicious selection to confide this important expedition to a man of his scientific attainments, energy and capacity.

Messrs. Sidensner and Lopatin have explored the Rivers Ket and Chulym, in Siberia, to ascertain if it is possible to join the Rivers Ob and Yenisei. They found that the River Ket could be used for that purpose, but that the Chulym could not. They traced the Ket to its source.

NORDENSKJÖLD'S EXPEDITION TO THE YENISEI.

Prof. Nordenskjöld, whom we expected to have had the pleasure of seeing at our meeting last July, left, as you will remember, shortly before, that he might be in time for his second expedition to the mouth of the Yenisei to organize a commercial communication by

water between the northern countries of Europe and the northern portion of Asia. A German writer, in a paper published during the year, declared such an undertaking to be hopeless. He said that, although Prof. Nordenskjöld had succeeded in getting through to the Kara sea last year, it was under exceptionally favorable circumstances; that two Norwegian captains had both lost their vessels in the straits by which Nordenskjöld passed; and that if he made the attempt again it by no means followed that he would be successful. I mention this circumstance to show how prone what are called "parlor" geographers are to make unfavorable predictions, and how unsafe it is to do so. Prof. Nordenskjöld not only passed again safely through the straits into the Kara sea and to the mouth of the Yenisei, but has already returned. He found the Kara sea free from ice in September, and declares that the navigability of the Yenisei is now ascertained, and is confident that a trade route may be established to that river through the Kara sea, in which Dr. Finsch, who passed through shortly after Nordenskjöld, fully concurs.

TIBET.

A wonderful journey has been made through Tibet by the Pundit Nain Sing, of Colonel Montgomerie's corps. Starting from Western Tibet, he followed a series of lakes upon an elevated plateau, from 13,000 to 15,000 feet high, for a distance of 800 miles, the most westerly of which lakes is the Pagong, seen by some of the members of Forsyth's expedition. To the north of the Pagong he discovered numerous great lakes, which receive the northern drainage of the Himalayas.

JAPAN AND SIAM.

Lieutenant R. Crooke made an interesting journey on foot through the mountain districts of Central Japan, of which he has given an account. The route he traversed is little known to Europeans. Lieutenant Day, U. S. N., has made a trigonometrical survey of the island of Hokkaido, and Mr. D. P. Edwards, of Bangkok, made an extensive journey through the interior of Siam, gathering a large amount of valuable geographical information.

PERSIA.

Doctor Andrez, to whose expedition to Persia I have heretofore referred, was engaged during the year in making excavations at Kisbeker, where he had found many cuneiform inscriptions. After terminating his labors there he intends to made like explorations

among the ruins of Shappur and of Persepolis. Colonel McGregor, of the British army, has made a journey through a part of Persia to the Russian frontier and returned by the route of Colonel Napier, of whose journey I gave an account last year. It appears, by a statement of Colonel Napier, that the Turcomans are undergoing a desirable change—that they are giving up their marauding habits and becoming agriculturists.

INDIA.

The great survey of India goes on at the rate of 40,000 square miles per annum. Mr. Scanlan, of the organization, has given a graphic account of Deolia, built only 376 years ago, but now its houses are tenantless, its streets desolate, and silence reigns in its highly decorated palace; and F. B. Girdlestone visited the ruined city of Manda, the ancient capital of Malwa, the walls of which covered a circuit of thirty miles. Its former magnificence was apparent in the enormous mass of ruins of palaces, tanks, temples, and of towns and villages around it. Its decay, says the editor of the Geographical Magazine, was the result of the destruction of its ancient kings and armies by constant wars, which drove the tradespeople to other marts and converted those who remained into predatory hordes. The country where it is situated is now difficult to approach, unhealthy, abounding in wild beasts, and inhabited by the Bhils, a people who are very averse to being intruded upon, and who would not furnish guides or aid the surveyors in any way.

PALESTINE.

Mr. Victor Guérin has been engaged in exploring the ruins of Pala, Guadara, Galama, and other ancient cities, and is to complete his work by an exploration of Tyre and its environs.

The American Palestine Exploration Society has suspended the work of triangulation, in accordance with the advice of the advisory committee in Beirut, both because of the disturbed condition of Turkey and the continued commercial depression at home. The engineers have reconnoitered nearly the whole territory east of the Jordan. Dr. Selah Merrill, archæologist of the society, remains in Syria to prosecute the work entrusted to him. He has carefully explored a portion of the Jordan valley, and has made important discoveries. The society has received 100 large and splendid photographs of ruins and scenery beyond the Jordan; also, more than 130 stuffed birds, to illustrate the ornithology of the Holy Land.

RUINED CITIES EAST OF THE JORDAN.

I have frequently called your attention to the remarkable remains that are found in the country east of the Jordan, the Moab, Bashan and Gilead of the Bible, of which, until the recent explorations, nothing comparatively was known. Though this part of Syria may be reached in a few days from the northern part of the Dead Sea, or from the Sea of Galilee, it is not visited by travelers, in consequence of the rugged nature of the country and the hostile tribes of Bedouins that inhabit it. It has now been ascertained to abound in architectural and archæological remains of the greatest interest. It is literally strewn with ruins of towns and of structures, many of them remarkable for their massiveness, which belong to a past civilization of which we know nothing. You will remember that some years ago, from the indications which then existed, I expressed the opinion that this must have been, at an early period, one of the chief routes between Asia and Africa; and the ruins which have since been found in the explorations carried on by the American society, confirm that impression.

Dr. William Thomson, the veteran American missionary and explorer in Syria, says in a recent letter that, in making a tour through this region, nothing ever impressed him so much as the richness of this field in the remains of ancient civilization. He says that there are not only acres on acres of splendid ruins, but fortifications, temples, baths and theaters, the best preserved in existence, and which have evidently stood undisturbed for ages. While on the west side of the Jordan, he remarks, cities have been robbed to build other cities, just as the ruins of Tyre are now contributing ship loads of stone toward building the present city of Beirut, the east side of the Jordan has remained unmolested for 1,500 years; and there exists there an unequaled combination of art and nature in an untouched condition of splendor and ruin.

AFRICA.

THE INTERNATIONAL CONFERENCE AT BRUSSELS.

The work of exploration and investigation in respect to the unknown portions of Africa has been vigorously followed up during the year. I alluded in the commencement of my remarks, to the important movement inaugurated by the king of Belgium. His majesty invited the leading African explorers, several eminent geog-

raphers, and the heads of the geographical societies of Great Britain, France, Germany, Italy, Russia and the United States, to meet him at a conference which was held on the twelfth, thirteenth and fourteenth of last September, at the palace in Brussels, to consider the subject of the scientific exploration of the unknown parts of Africa, and the best methods of penetrating into the interior of that continent, with a view to its civilization and the abolition of the slave trade. At this conference, over which the king presided, and which was of a very interesting character, the well-known African travelers, Col. Grant, Rohlf, Schweinfurth, Nachtigall, the Marquis de Compiègne, Lt. Lux and Commander Cameron, at the request of the king, gave a brief account of their respective labors and experiences, and the conference, after a very interesting discussion, arrived, with great unanimity, at these conclusions:

1. That there should be established an international commission for the exploration and civilization of Central Africa, with a view of centralizing, as far as possible, such efforts as might be made in different nations to facilitate that object.

2. That the commission should be composed of the presidents of the geographical societies which were represented at the conference, or who should thereafter become attached to the organization, and of two members to be chosen from a national committee to be established in the countries represented.

3. That the central commission, after adopting its rules, should, through the organization of a permanent executive committee, carry out the enterprises and labors agreed upon, and manage the funds furnished by governments, national committees or by individuals. The executive committee to consist of the president and of three or four members designated at first by the conference, and afterwards by the international commission to be established.

4. That the best course of procedure was to establish a permanent station upon the eastern coast of Africa, from which a chain of stations might gradually be extended into the interior, which, while affording every facility for missionary efforts or commercial enterprises, were not to be directly connected with either, but to act under the direction of the international commission in carrying out its general objects.

The international commission was accordingly organized; his majesty the king was made the president; the early executive committee, to be located in Brussels, was appointed, and measures were taken for the formation in the different nations of national commit-

tees, which are now being effectively carried out in the several countries. His majesty did me the honor to invite me to the conference, but very much to my regret my judicial engagements at the time made it impossible for me to go. He has since advised me that I have been made a member of the international committee, with a request that I would undertake the formation of a national committee in this country, which I have agreed to do, and am now taking measures to carry out, in conjunction with gentlemen interested in this plan for exploring the interior of Central Africa, and advancing civilization in that large, fruitful and healthy region of the great African continent.

I cannot speak in terms too eulogistic of the example set by this enlightened monarch in inaugurating this important movement; of the earnestness with which he has imposed upon himself laborious duties to carry this great measure into effect; and when so many of the leading nations of the world have already coöperated, I feel assured that the citizens of the United States will not be found wanting in an appreciation of, or fail to do their part to ensure the success of, a movement which addresses itself alike to their humanity and their intelligence.

WEST AFRICA.

A. Beaumier, the French Consul at Mogadore, in Morocco, who died last January, left the result of his journeys during a period of twenty years along the west coast of Africa, from Tangiers to Mogadore, with which he was better acquainted than any European, in the form of a valuable map; and M. Tissot, the French Minister at Morocco, has supplied a valuable topographical map of the northwest coast to 34° N. lat. both of which maps have been published by the Paris Geographical Society.

THE NIGER, VOLTA, OGOWE AND CONGO RIVERS.

Mr. A. Bowdin, who has advanced into the interior from Sierra Leone, is satisfied that a new route might be found in that direction to the source of the Niger, and declares that if the pacific course of Commander Cameron were pursued that there would be no difficulty in a solution of the Niger problem. A. Bonnat, a resident of Western Africa, has ascended the Volta, and made a valuable map of the river up to the city of Salaga. He found the river as wide and as deep at Tegly as it is at Medica, sixty miles from its mouth, and infers from this that its sources must be far away in the interior. It

is a river of 200 miles in length, which takes its rise in the Kong mountains. The exploration of the Ogowè river, just below the Equator, the mouth of which is in the possession of the French, has been for some time an object of interest as a means of penetrating the interior. The Marquis de Compiègne made the attempt, but reached only as far as Osieba, when he was compelled to return, in consequence of the hostility of the natives. It was last year renewed by Lieutenant Brazza, of the French navy, who has undertaken to explore the river, and to make his way, if possible, to the Mwutan Nzige (Albert Nyanza). Lieutenant Marche followed him, and both travelers reached Okanda last February, where they were joined by Dr. Bailly. They were assured that the Ogowè flows from the north to within a degree of the Equator, and then turns sharply to the south. They were heard from last June, were doing well, and at the end of the rainy season were to start for the countries of the Aduma and Oss Yebs. Dr. Lenz, who had gone as far as the country of the Sunbaz, was compelled to return from ill health. Drs. Peschuel-Loesche and Linder have undertaken to penetrate the interior from Loango, and Dr. Pogge, who was engaged in exploring Angola, is supposed to have reached Kabebe, about 24° E. long, and to be on his way to Lake Tanganyka, in E. long. 29°. P. Duparquet, a Catholic missionary, has ascended the Congo as far as Bomba, which he found quite European in its features, the natives having removed altogether to the neighboring villages, which are very populous.

ANGOLA.

Mr. J. S. Monteiro, who has enjoyed unusual opportunities for observation, has, in a recent work on Angola and the River Congo, furnished a valuable amount of information upon this part of the country, its productions and inhabitants. His estimate of the negro character is a very low one. It is that he knows neither love, affection nor jealousy, and has no idea of mercy or compassion ; that he is characterized by an absence of good qualities, feelings and emotions that we can scarcely realize to be wanting in human nature. This may be true of the African of that part of the eastern coast, but it is to be hoped that it is not true of the aborigines of Africa generally.

LOANDO.

Lieutenant Lux penetrated from Loando into the interior. He

crossed the Talamunga mountains, from 4,000 to 5,000 feet high, and reached the Quango river, which he ascended to its source, in a hilly table-land, where it rises with three other rivers, one of which he looked upon as the head of the Congo; but the information collected by Cameron, it is thought, renders it highly probable that the Lualaba of Livingston is the Upper Congo. Lieutenant Lux reached the country of the Muata Yanvo, but was attacked by fever and compelled to return.

THE PIGMIES OF AFRICA.

The subject of the pigmies of Africa has been recently discussed by Mr. Marcette and the Marquis de Compiègne. When our fellow, M. de Chaillu, several years ago laid before us the account of the pigmies he had found in Western Africa, near the Equator, it was received in certain parts of Europe with incredulity; but these pigmies of the western coast have since been seen by others, and the existence of races of pigmies is now established by the facts gathered by Schweinfurth, Miani and others in Africa, and by recent researches in India. Mr. Marcette says that these pigmies were well known to the ancient Egyptians, and that there is a bas-relief in the sepulchre of the Necropolis of Saggarale, of the fifth dynasty, upon which two pigmies are represented having the features of Dr. Schweinfurth's Akkas. He says the pigmies of antiquity were natives of Pun, which he identifies with the modern Somali country. The Phœnicians, he says, came from Pun, and were not an Asiatic race, and that near them dwelt a race of dwarfs called Bess, who still exist in the Somali country, if the information collected by Heuglin could be trusted. He exhibited to the Egyptian Geographical Society representations of the Bess, some of whom had tails, which may be gratifying intelligence to these evolutionists who insist upon our descent from the monkey. Mr. Marcette believes that the Akkas of Schweinfurth, who dwell in the Nyam Nyam country, were also known to the ancient Egyptians, and that Nam in their language meant dwarf. M. de Compiègne thinks that these pigmies extend from the south of Mombutta to the Gaboon.

An inhabitant of the Gaboon, in the person of a live young gorilla, is now in the Berlin aquarium. Dr. Herne says that he nods, claps his hands, wakes up and stretches himself like a man; that he sleeps eight hours, eats only what his keeper eats, and requires him to be constantly with him. He was taken sick and was restored by the use of that fever specific, quinine, and the doctor says that he showed

his tongue and afterwards squeezed the doctor's hand, as if to indicate that he felt assured of his recovery.

AKEM—HORNED MEN.

Capt. I. S. Hay, B. A., has recently visited the district of Akem, which lies west of the River Volta, in the north of that portion of Ashantee which after the war was annexed by the English. It is a heavily wooded country, in which the trees have an immense height and girth, some of which he found to be over 200 feet high. The soil is exceedingly rich, but the forests being left in their primeval state, cultivation has been impossible. The entire country is auriferous in a high degree. It is well watered, and the towns, which are on or near the hills are numerous. The climate is humid throughout the year; the men are capable of undergoing great fatigue, but are incorrigibly idle, and the women do all the work. Amongst the men he found an extraordinary growth or enlargement of the cheek-bones under the eyes. It is in the form of horns on each side of the nose, and so long that in some instances the man had to squint violently to see at all. The growth begins in childhood. The skin is not broken, but stretches over the horns like a glove. This phenomenon he thought peculiar to the tribe in Akem, as he did not find it in any other. Photographs of these horned men, it is said, have recently been received in England.

NORTH AFRICA.

MM. Roudaire and Depuis have presented their plan for submerging a portion of North Africa, from the Gulf of Gabes, by letting in the water of the Mediterranean westward over the region of Laho-Dejerld, which, it is assumed, would not only be practicable, but remunerative. From the small area submerged, none of the important meteorological changes of the winds and currents of the North Atlantic are apprehended, which were suggested as likely to occur from the former proposition to submerge the western part of the Sahara.

M. Largeau made a journey in the course of the year across the southern part of the Algerian Sahara to Ghadames, of which he gave a very full account in a series of letters to the New York Herald. The object of the expedition was to establish regular commercial intercourse between Ghadames and Algeria, and this winter M. Largeau started again upon a like journey.

Doctors Schweinfurth and Güssfeldt made an exploration of the

Arabian desert east of the Nile. They found the Lybian desert surrounded by steep precipices, being the old coasts of an eocene ocean. They spent several days upon the summit of the Galâla, where a flora was found new to Egypt, 3,300 feet above the sea, and the plateau was covered with such a dense carpet of herbs that it was impossible to touch the soil. The geographical position of many places was determined. The scenery through which they passed is described by them in glowing terms.

Darfur has been organized under an Egyptian governor and now forms a province of Egypt. The exploration of the country has been actively prosecuted, and the population is computed at 300,000.

LAKE MWUTAN NZIGE (ALBERT NYANZA).

The most important event in Africa, of the year, has been the circumnavigation of the Mwutan Nzige (Albert Nyanza), by M. P. Gessi, a member of Col. Gordon's organization. He estimated the lake to be 140 miles in length by fifty in breadth. Its banks were clothed with a dense forest, the western side was mountainous and the southern end shallow. This exploration establishes the connection between this lake and the Nile.

From united statements of Gessi and Colonel Gordon, very recently received, it appears that the White Nile is navigable the whole way from Dufli to the lake, a distance of 164 miles. About twenty miles south of Dufli the river widens, the current is less rapid, and from there to Magungo (on the lake) the river is nothing more than a part of the Mwutan Nzige. This river or expansion of the lake is broad, deep, and filled with islands of papyrus, which make the banks difficult of approach. About 100 miles from Dufli there is a large branch of the river, extending north-north-west in the direction of the Nyam-Nyams. This is upon the report of Gessi. Colonel Gordon did not see this branch, but states that he has no doubt of its existence. The country from Dufli to the lake is rich, exceedingly populous, cattle are abundant, and plenty reigns everywhere. Gessi says, on native information, that there is no river flowing into the lake at the south ; but native information cannot generally be relied on, and there is no certainty on this point until its extreme southern shores have been reached and fully explored. Gessi assumed, from its shallowness and marshy appearance, that he had reached the southern end, but the lake is much longer ; for Stanley, last January, in an expedition, to which I shall hereafter refer, reached it about

thirty miles below the limit of Gessi's southern exploration, coming upon a large gulf, to which he gave the name of Beatrice gulf, and of which there is no indication on Gessi's map.

Whilst Gessi was circumnavigating the lake Colonel Gordon explored the country east of it, establishing a chain of military posts from Gondokoro to both the Mwutan Nzige and the Ukerewe (Victoria Nyanza). He penetrated to M'ruli, on the Somerset river, and has established a station at Masuidi, the capital of Unyoro. The Somerset Nile, which connects the two lakes, he says, is navigable from the Mwutan Nzige to Murchison's falls; but from there to the Karuma rapids that it abounds in strong rapids; and between Murchison's falls and Foueira that it has a fall of 700 feet.

STANLEY'S EXPEDITION.

Mr. Stanley, after exploring the west and south-western shores of Lake Ukerewe (Victoria Nyanza) started from Dumo, on its western shore, and crossed the country of Unyora, to the Mwutan Nzige (Albert Nyanza), and reached that lake, as I have said, at a point where a deep gulf (Beatrice gulf), formed by a promontory called Usongora, runs out for thirty miles in a south-westerly direction.

In his journey Stanley saw a mountain south-east of the Mwutan Nzige, which was reported to be from 13,000 to 15,000 feet high, called Gamboragarè, on the peak of which snow is frequently found.

The exact position of his camp on the lake, as given by him, is 31° 24′ 30″ E. long., and 0° 25′ 0″ N. lat.

The country of Unyora, he says, extends along the whole eastern shore. The country on the south shore is called Ruanda. On its western shore, opposite Gulf Beatrice, is Ukonju, said to be peopled by cannibals, and that its further western shore to the north is the country of Ulegga. Stanley learned that the people on the south and south-western shores were very hostile, and abandoned all attempt to explore the lake in that direction. Retracing his steps, he entered the Kitangule river, the main feeder of Lake Ukerewe, and, following up the course of that river, he circumnavigated the lake named by Speke Lake Windermere, and after a three-days' journey reached another lake, nine miles long by one mile wide, which may be but a temporary enlargement of the river, as he was traveling in the rainy season; and afterward, on the frontiers of Karewega, he found Lake Akengara, noted on Speke's map. Stanley, when last heard from, in July, was on his way to Unamyembi; his intention being to pro-

ceed to Ujiji to explore Lake Tanganyika, and then endeavor to strike north toward the Mwutan Nzige (Albert Nyanza).

CENTRAL AFRICA.

Commander Cameron gave a detailed account of his journey across Central Africa to the British Association. He said that the result of it was almost to settle definitely the line of the Central African lake sources; that the chief products now of Central Africa were ivory and slaves, carried on by the Portuguese and Arabs; that the Arabs, coming from the east coast, had penetrated into the interior of the country west of the Tanganyika; and that westward from Katanga there were large copper mines; that coal was found in the Tanganyika country, cinnabar at Kilemba, and tin on the shores of Lake Kassala; that sugar-cane grew well along the whole eastern coast and along the Tanganyika. Rice in several places grew in wild luxuriance, and in one year returned a hundred-fold under cultivation. Wheat was cultivated, and cotton grew all along the valley of the Congo, Lualaba and Zambezi. On one of the islands of Lake Tanganyika hemp was found growing to a great height. The whole country, however, was at present a vast slave-field, and all the various products he had mentioned were lying there for any one to take them away. Ivory, he remarked, was not the chief wealth of Africa; it was her vegetable and mineral products, and education would make her people very industrious were they not ruined by the slave trade. He declared that the way to stop that trade was to open up the rivers Congo and Zambezi; and finally that there was a way across the continent by a system of water navigation which had no second in the world.

LAKE NYASSA.

The missionary establishment on Lake Nyassa, in memory of Livingstone, has been successfully established by Mr. E. D. Young. A steamer was carried in parts to the lake, and there put together and launched. Last February, a communication was received by the Royal Geographical Society from Mr. Young, giving an account of the exploration of the lake with this steamer. The lake was found much larger than Dr. Livingstone supposed, the north end extending to 9° 20″ south latitude. In most parts it was very deep, in some places no bottom being found at 100 fathoms. It has a range of mountains extending nearly a hundred miles, ranging from 10,000 to 12,000 feet above the sea. It has a number of rivers running into it, but none navigable to any great distance, and a river running out

of it called, by the natives, Revoma. The shores are not so thickly populated as formerly, as a great number of the inhabitants have been carried off as slaves. In some parts of the lake there are a number of villages built on piles, so that we have here, also, the piled dwellings like those found on the Swiss lakes, and in Central Africa and New Guinea.

The scenery of the lake, as described by Mr. Young, is grand in the extreme. He says that he visited some lovely spots and the sites of many villages, where the ground was strewn with thousands of skeletons, the remains of poor creatures who were killed in attempting to escape from the slave traders. From the information he gathered, he thought that no less than 20,000 persons a year were carried off as slaves. The Arab traders were astonished and alarmed when they heard that there was a steamer on the lake, and no slaves were conveyed across it for a month. "Oh! how I long," writes Mr. Young, "to have a turn at them and clear the blood-thirsty wretches out of this lovely country. I believe that a steamer with a dozen resolute Englishmen and a few bales of calico would put a stop to the whole traffic," and as this is one of the great central points of the slave trade of Eastern Africa, every friend of humanity must unite in the wish that this philanthropic explorer may succeed in accomplishing what Livingstone had so deeply at heart, and to which he gave up the best years of his life. Mr. Young says: "The common people are rejoiced at our presence; for many miles around us slavery has ceased, as there are no Arabs brave enough to come near us."

The Rev. H. Waller, in commenting on Mr. Young's letter, drew attention to the fact that the southern end of Lake Tanganyika was now known to approach very closely to the northern end of the Lake Nyassa, from which there was a clear water-way to the Indian ocean. He remarked that if the slave trade was to be confined within bounds it must be by the navigation of those lakes, and that many indulged the hope that more steamers would soon be found upon them. Commander Cameron stated before the British Association that there would be no great difficulty in carrying a steamer from Lake Nyassa to Lake Tanganyika, and that it might be possible to introduce the steamer from the Tanganyika into the Congo, and carry it thence to the coast. That, at all events, a connected service of boats from both coasts might establish a direct communication across Africa, which would protect traffic and put an end to the slave trade.

EAST AFRICA.

It will be remembered that Colonel Long, in descending the Victoria Nile, found that the river opened into a large lake called Lake Ibrahim, which he supposed to be about thirty miles long. Signor Piaggia, who accompanied Gessi to Magungo, on the Mwutan Nzige, ascended the Somerset river to M'rooli, and from thence, with a party of natives sent by King M'tesa, he continued his explorations and came upon a lake which he calls Lake Capechü, which he found to be fifty miles long. Colonel Long, whilst in this city, received a telegram from Cairo announcing this fact, and told me that from the information received it was undoubtedly the lake he had discovered in descending the Victoria. He says Signor Piaggia found two rivers flowing into the lake from the north-east, which Colonel Long supposes to be the Asria and Saubat. Colonel Long says that the Victoria Nile is very transparent to Lake Ibrahim, and that as the river approaches that lake, the current is very slight, being kept in abeyance by the mass of vegetation in the lake. He found the lotus growing up in twenty feet of water, and spreading its broad leaves, two feet in diameter, over the surface. I regret that Colonel Long was compelled to leave this city for Egypt before the meeting of the Society, and that you had not the pleasure of hearing from our countryman an account of his labors in Africa.

The Rev. R. Price has made a journey from the coast of Zanzibar to Mpwapwa, on the way to Lake Tanganyika, and found a route to the interior highlands, which is free from the fever swamps of the old route, and from that great scourge of East Africa, the tsetse fly; a fact of great importance in the opening up of Central Africa.

An Italian expedition, under the Marquis Antinori, which has been fitted out at an expense of $20,000, started out last February for the exploration of the country on the east coast, between Shoa and Lake Ukerewe (Victoria Nyanza). Its entrance into the interior was delayed both by serious losses upon the journey outward and by difficulties with the local authorities on the coast. From an account recently received by the Italian Geographical Society, he had, after many hardships and delays, reached Liecè, the capital of Shoa, where he was hospitably received by the king, and is to make Shoa a base for a scientific exploration of the lakes. The expedition is to be absent four years.

G. A. Haggenmacher succeeded, after endless conflicts and difficulties, in penetrating into the Somali country for 100 miles, when he was compelled to return, barely escaping with his life. This is

the first attempt in this direction since Capt. Burton's expedition in 1854. Haggenmacher died shortly after his return. His journal and papers, which he succeeded in bringing back with him, are said to give a very complete account of the geography, industry and traffic of the country, as far as he went. Bishop Restell Cornish made a four months' tour in the interior of Madagascar, and visited many places where no foreigner had previously been.

I regret exceedingly to hear of the recent death of Mr. Rebman, the well-known missionary, who first suggested the existence of a system of lakes in Central Africa, which was verified by the discoveries of Burton, Speke, Grant, Baker, Livingstone, Long and Stanley.

SOUTH AFRICA.

Very little, if anything, in the way of geographical discovery has occurred in South Africa. The diamond fields of the Orange Free State, and the gold fields of the Transvaal Republic have not only attracted the enterprising and adventurous who might otherwise have engaged in geographical explorations, but have involved these rising, industrious and prosperous African republics in difficulties which have proved anything but beneficial to them.

TRANSVAAL REPUBLIC.

The Boers, the name by which the descendants of the Dutch colonists who settled the Cape of Good Hope are distinguished, and which, in the Dutch language, simply means farmers, being unwilling to live under English colonial rule in Cape Colony, migrated in large numbers northward, beyond the British limits, to an unknown country, where they founded the Orange Free State, and afterwards, to the north of it, the Transvaal Republic. An honest, simple and industrious race by whom nearly all the hard work in the colonization of South Africa has hitherto been performed, they found in their new home a fruitful and healthy region, which, under their patient industry, probity and thrift, was rapidly becoming, when these diamond and gold fields were discovered, one of the most prosperous, moral and desirable parts of Africa. The discovery at once attracted the cupidity of their English colonial neighbors, who have ever since, through the colonial officials and otherwise, pursued a line of policy, the unmistakable object of which is to annex these young republics and convert them into British possessions. In utter

disregard of the rights of the Orange Free State, the diamond fields, which have hitherto yielded diamonds to the value of fifteen millions sterling, were claimed by the English, and the only recognition of their rights that the colonists have been able to obtain from the British government is the payment of a comparatively small sum of money for giving them up. In the Transvaal, where the gold fields are situated, a different policy has been pursued. The natives, with whom the colonists have hitherto lived in amity, have been incited, by British officials and secret agents, to take up arms against them, and we read in English journals of the approaching dissolution of the Transvaal Republic through their war with the Kaffirs. This rising young African republic, the government of which has been carried on with marked intelligence and ability, has effected a loan in Holland for a railroad from its capital, Pretoria, to Delagoa bay, on the east coast, which has one of the finest harbors in Africa, the use of which for the railroad has been ceded by the Portuguese government for one hundred years. This railroad is now in the course of construction, and when finished will draw off the whole trade of the Transvaal from Port Natal, in the British Colony of Natal, which is now the only outlet of the Transvaal; and the evident design of stirring up the Kaffir war is to prevent the construction of this important work, and bring about such a state of things in the infant republic as will make its acquisition by the English little more than an easy act of taking possession. It is impossible not to feel, especially in this country, a strong interest in these young African republics; and should the Transvaal succeed in building its road to Delagoa bay, every measure should be taken for establishing, at the earliest opportunity, direct commercial intercourse between it and the United States, which would be maintained and augmented through mutual interests and a warm mutual sympathy.

NEW GUINEA.

An object of geographical interest, at present, is the great island of New Guinea, which, notwithstanding its magnitude, its fruitfulness and position in the great ocean highway in which it is placed, was thirty years ago put down in the geographies as *terra incognita*, or, as the geographer Murray expressed it, as "viewed only by navigators at a distance." During the last five years it has been the scene of active explorations by Beccaria, D'Albertis, Moresby, Rosenberg, Maclay, the Russian explorer, and Macleay, the English explorer, Macfarlane, Stone and others.

It will be remembered that I mentioned in my last address that Miss Baxter, of Dundee, had given a steamer—the Ellangowan—for explorations in New Guinea. With the aid of this steamer, the Rev. Mr. Macfarlane was enabled to ascend the Baxter river for ninety miles, sixty miles only proving to be navigable. He, also, accompanied by the Italian naturalist, d'Albertis, who has done so much in the exploration of New Guinea, explored the Fly river in this steamer. They found the river five miles wide at its entrance, and that it widened after they had gone ten miles. They sailed up it to a distance of 150 miles, passing many beautiful islands, and thought it probable that they might have gone 100 miles further, the river still stretching away to the north-west, broad and deep at the point where they stopped; but the rainy season was approaching, their provisions were getting short, and the Europeans had become dropsical. "Our legs," says Mr. Macfarlane, "were like putty—would take any impression; and the mosquitos and other insects were a terrible pest and devoured us, although we washed ourselves from head to foot in kerosene."

In the first 100 miles of their course up the river, they found its shores thickly peopled by a mixed race, Papuan and Malayan, speaking different dialects and at war with each other, and found them to be an intelligent, brave and energetic people. As the explorers first ascended, the natives came on board and were friendly, but at a point further up they were hostile, gathering in large numbers in their canoes, and would have attacked the vessel fiercely had they not been fired upon, when they paused and then suddenly retreated; their canoes, says Mr. Macfarlane, flying back over the calm surface of the water as if their inmates were pulling in a regatta. The whole country through which they passed was low and swampy, and from the point to which they ascended, as far as they could see, it continued to be so.

Upon their return the natives were again hostile. As they approached a large village, one of the houses of which was about 500 feet long, the natives followed them with their canoes, and it being evident they meant to attack, a charge of dynamite was thrown overboard with a long fusee, which exploded as the canoes approached it. When the natives felt the shock and saw the water bubbling up about them, they appeared utterly bewildered. Those standing up dropped as if they had been shot, and none of them ventured to pull another stroke for fear of being blown into the air or engulfed in the sea, which proved a fortunate check, as the vessel

shortly after got aground. The next morning the natives approached the vessel unarmed and a friendly intercourse took place, presents being given them, in exchange for which they returned with an an ample supply of provisions. They afterwards came on board, and went over the steamer without the slightest sign of fear, except on the part of one of them, when he found himself suddenly before a large looking-glass.

"We have proved," says Mr. Macfarlane, "by this expedition, that there is in this part of the island a large navigable river, extending far into the interior."

Last August d'Albertis, in a small steamer, started upon a new expedition to the Fly river, and ascended it, it is said, 350 miles, but could not communicate with the natives, whom he found to be numerous and hostile. His object was to trace the river to its source, and then to cross the country to Port Moresby. Recent intelligence received is that he has now returned, and has fully explored the river. Miclucho-Maclay, who has made extensive explorations in New Guinea, was engaged last July in explorations on the north-east side of the island about Astrolabe bay, the part of the coast which has been named after him ; and he reports that in April an earthquake occurred in the highlands in that vicinity. which destroyed many villages.

The Rev. George Brown, a missionary, visited the islands of the north-east coast of New Guinea. He describes the natives as nude savages of the oriental negro type, who live more like beasts than human beings. He found cannibalism prevailing throughout the islands, not, as among some other savages, as a religious rite, but as a means of subsistence. He has given the details of what he saw of this horrible practice, which are too revolting to repeat. He says he was assured by the natives that there was in the islands a race of human beings with tails, who were not monkeys; that the tail was bony and inflexible, so that those with this caudal appendage had to dig a hole in the sand before they could sit down, as they died if the tail was broken. We have thus revived the account of the men with tails heretofore reported to exist in Borneo and the interior of Africa, but always upon native information, with the exception of hearsay information alleged to have been given by a sailor cast away on the coast of Borneo, and, like all such information, of little value.

Mr. O. Stone explored certain portions of the southern peninsula of New Guinea, the entire shore of the Papuan gulf, and the neigh-

borhood of the Baxter river, for a hundred miles inward. He found the country watered by the Baxter low and swampy, covered with forests of mango trees, and thinly populated; in this respect contrasting strongly with the Fly river, ascended by Macfarlane and d'Albertis, which for sixty miles from its mouth swarmed with human beings. The Malayan population of the eastern shore, he says, are far above the savage, intellectually and morally, and are opposed to the polygamy and cannibalism which exist among the Papuans.

As Mr. Stone and his party approached the great central backbone of the peninsula, a lofty range of mountains running north and south, they found, at a height of 4,000 feet, dense forests of tropical vegetation, tall trees, and an undergrowth which covers the whole northern range, except the top of Mount Owen Stanley which rises in a double peak to 13,205 feet.

Only one gap or opening was seen in this imposing mountain range, which rises to a height of 8,000 feet. Owing to the frequent rains in the mountains, the soil is very rich; sugar canes, yams and sweet potatoes attaining an immense size. Bread fruit and mango are indigenous, and tobacco cultivated in the interior; with a terrace system of irrigation, rice, he says, may be cultivated, and on the open land the cotton tree is found. The people are of a brighter color than those of the Fly river, and not so warlike. He found them inoffensive, friendly, even jovial, and very different from the sullen, apathetic Malays. They have frizzled hair and are darker than the Malays. The women take an active part in any disturbance, and were found more capable of making a hard bargain than the men. None of the tribes believe in a God, although attributing everything extraordinary to some supernatural agency.

The climate of this part of the peninsula, he states, is relaxing. It is impossible to live in the valleys without impairing the constitution from the excessive moisture; but in the interior it is more salubrious. Birds are very numerous, conspicuous amongst which is the bird of paradise, but flowers are scarce.

Mr. Stone's general opinion was that the west coast would prove a grave to Europeans, but that the eastern portion of New Guinea was, on the whole, favorable to cultivation; that it possessed great mineral wealth, and offers sufficient inducements for colonization; but would require much prudence and consideration, owing to the peculiar character of the country and the circumstances of the people.

D'Albertis, who has had much more experience than Mr. Stone and knows much more of the country and people, recommends the Dutch method of colonization instead of the English. The Dutch, he says, civilize the natives, but the English supplant them. He describes the natives of New Guinea generally—and he has had large opportunities for observation—as an intelligent, industrious and docile people, capable of development.

Signor C. E. Cerruti has been exploring in north-west New Guinea and thinks that before long it will be occupied by some civilized nation. He describes the island as covered with a vegetation unsurpassed in luxuriance in any part of the world. "Cattle and sheep," he says, "can be easily raised over a land now wasted by about 50,000 savages."

D'Albertis and Cerruti's information is very encouraging in respect to this large and fruitful island, which is 1,400 miles long and from 450 to twenty miles wide, and may become in the future the seat of an important civilization.

A journal kept by the Rev. Mr. Loes, in New Guinea, during a voyage from Port Moresby to the China straits, has been published in the London Times. At Hood's bay he sailed up a considerable river, and near the coast found a large village, laid out in streets and squares, scrupulously clean, and also carefully cultivated flowers. He saw the natives hewing canoes of large size and excellent make with stone hatchets, and at Cape Rodney, upon a lagoon, he saw a regular lake village, the habitations being supported by piles, like those lacustrian villages the remains of which were found some years ago on the borders of Swiss lakes.

The Rev. J. Macfarlane, in the *Ellangowan*, in the course of the year, examined the coast east of Yule island, and found a town of 2,000 inhabitants called Kerepunam, the people of which showed a remarkable advance in civilization, living in well-built houses with carefully cultivated gardens, and, like the village seen by Mr. Loes, it presented the pleasant spectacle of well swept streets. From Amazon bay to the China straits the people were found to be more numerous, intelligent and healthy than in other part of New Guinea.

It is reported at Port Moresby and along the coast that there is a village inhabited by women somewhere near Amazon bay, which probably suggested the name of the bay.

AUSTRALIA.

Mr. E. Giles, to whose labors I have so frequently referred, has returned after an exploration of that portion of the Australian continent lying between Murchison and the overland telegraph line. He traced the Ashburton river to its sources, thus defining the extent and position of the western water-shed, which abuts on the desert in 120° 20′ E. long. From the Ashburton he proceeded as far as the twenty-third parallel. No water-courses were found flowing to the eastward, and he journeyed along the twenty-fourth parallel to 127° E. long., and found the country an open desert.

NEW ZEALAND.

From the result of researches made by Prof. Haast in caves in New Zealand, it would seem that an enormous length of time must have elapsed since the extinction of the moa, the gigantic bird of New Zealand.

CONCLUSION.

I have thus given, though very imperfectly, a survey of the geographical work of the world during the last year, and regarded as the work of a single year I think it justifies what I said in my last address—that we are living in a great geographical age.